

## Consequences of CLO Portfolio Constraints\*

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### Abstract

We explore the extent to which portfolio constraints set in CLO prospectuses are associated with CLO equity tranche returns and managers' trading choices. We show that CLOs that are small, have been issued recently, mature sooner and face greater influence from junior noteholders receive more stringent portfolio constraints. We also document that CLO portfolio constraints are related to lower junior coupon premiums, suggesting that junior CLO investors exchange cash flow rights with control rights. Regarding equity tranche distributions, we find that constrained CLOs offer lower equity returns on a cash-flow basis, and this adverse effect seems to be priced by CLO equity investors when trading their equity claims in the secondary market. Moreover, CLO managers facing more restrictive constraints rebalance their loan investments more frequently and to a greater extent. They also liquidate profitable loan investments earlier and purchase riskier new investments to circumvent binding constraints. Our evidence highlights the potential detrimental effects of CLO portfolio constraints on equity investors' returns and on managers' trading strategies.

**Keywords:** CLOs, securitization, portfolio constraints, asset management

**JEL Classification:** M41, G23

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## 1. Introduction

The credit crisis of 2008 spurred significant regulatory reforms and structural changes aimed at reducing risk-taking behavior in the securitization market. As a result, recently issued Collateralized Loan Obligations (CLOs) have been structured with limited exposure to low quality corporate loans and tighter constraints to offer better credit protection to CLO investors. Despite the fact that these structural changes are commonly considered as positive developments in creating a more stable securitization market, the extent to which tighter CLO portfolio constraints have provided significant benefits to CLO investors and how these constraints affect CLOs' investment activities remains largely unexplored.

In this paper, we examine the effect of stringent CLO portfolio constraints on the returns to CLO equity investors, CLO managers' trading choices and CLO credit risk.<sup>1</sup> For a CLO to generate equity returns, the portfolio loan interest payments must substantially exceed the interest paid on CLO notes (i.e., the CLO's funding costs) and other expenses (i.e., management fees as well as loan transaction and other CLO operational costs). However, CLO managers' investment latitude is restricted by certain constraints set upon a CLO's origination, which impose minimum thresholds with respect to the coverage of the CLO's notes or the quality of the loan portfolio. A violation of these tests decreases payments to the equity tranche, as the manager needs to divert cash flows to retire the more senior notes. Thus, CLO managers rebalance the loan portfolios to generate equity returns while abiding by these constraints.

A study of the relation between CLO portfolio constraints and equity returns is relevant for several reasons. First, CLOs have fueled the substantial growth experienced by the U.S. private debt market over the last few years, raising about \$1.2 trillion of capital globally over the period

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<sup>1</sup> The main investors in the CLO equity tranche are asset managers, CLO equity funds, hedge funds, insurance companies or family offices.

2006-2017 and holding over 70% of the leveraged loan volume (JP Morgan 2018, Standard and Poor's 2015). Second, historical data shows that CLO notes have generated significantly lower default and cumulative loss rates compared to corporate bonds (LSTA, 2015).<sup>2</sup> Despite this relatively low credit risk, CLOs' equity tranche has overall provided double-digit annualized returns on a cash-flow basis, reaching an average of 18% in 2016 (Standard and Poor's 2017). Given that it is not clear how CLO portfolio constraints create value for CLO noteholders and equityholders, our study can offer some new insights to CLO investors. Importantly, given that a CLO's constraints are determined upon origination, they can provide an early indicator about the future returns achieved by the equity tranche. Third, CLOs report their quarterly payments to CLO investors allowing us to construct direct, model-free estimates of the realized equity returns that are not affected by investors' perception of risk or illiquidity.

To assess the impact of CLO portfolio constraints on CLO equity returns, we collect a sample of 1,255 U.S. CLOs with detailed quarterly data on CLO portfolio performance, test thresholds and scores, and distributions to equity holders. We construct a CLO portfolio restrictiveness index by first computing a relative restrictiveness score for each constraint (or test) specified in the CLO prospectus. We focus on four CLO tests that need to be met by the CLO on a monthly basis: (i) the minimum capital coverage or overcollateralization (OC) test, defined as the minimum ratio of the loan portfolio value to the principal balance of the CLO notes; (ii) the minimum interest coverage test, defined as the minimum ratio of the interest received from the portfolio loans to the interest payable on the CLO notes; (iii) the maximum weighted average rating test (or risk test), defined as a maximum average credit rating of the loan portfolio; and (iv) the minimum weighted average spread (or income test), defined as the minimum average portfolio loan spread. We

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<sup>2</sup> For example, the average default rate of BBB-rated CLO notes (corporate bonds) is 0.47% (5.27%) and, so far, there have been no defaults of AAA- or AA-rated CLO notes recorded.

measure relative test restrictiveness by using the distribution of threshold test levels for our sample CLOs. More specifically, for each CLO, we compute the difference between its test threshold and the minimum threshold of that test in the sample, scaled by the difference between the maximum and the minimum test thresholds in the sample. In the case of the risk test, we compute the difference between the maximum test threshold in the sample and a CLO's test threshold scaled by the same denominator. As a result, each restrictiveness measure takes a value from zero (least restrictive) to one (most restrictive). Finally, we compute an overall CLO-level constraint index as the mean of the four test restrictiveness measures defined above.

We first investigate determinants of CLO test restrictiveness. We find that CLOs that are smaller and CLOs with shorter maturities have more restrictive tests, potentially because CLOs' size and maturity are negatively associated with managers' reputation and experience. CLOs issued after the recent credit crisis have also on average more restrictive tests. In addition, CLO test restrictiveness is positively related to the volume of junior notes issued by the CLO, indicating that more investor claims vulnerable to CLO portfolio losses require greater protection. This greater protection is reflected in lower junior note premiums. We find that CLOs' test restrictiveness is negatively related to the coupon premium paid on junior tranches relative to the one provided to the senior tranches. In sum, these findings suggest that CLO characteristics that reflect managers' reputation and experience as well as the influence of junior note investors potentially affect the restrictiveness of CLO's portfolio constraints.

In the second set of tests, we examine the relation between CLO test restrictiveness and the cash distributions to CLO equity holders. We show that CLOs with stringent tests offer lower returns on a cash-flow basis to their equity tranche. Economically, an interquartile increase in CLO test restrictiveness decreases quarterly CLO equity returns by about 8.10% of its sample mean value.

These results hold for almost all CLO test categories. Relatedly, we find that CLO test restrictiveness decreases the price of the CLO equity tranche in the secondary market, suggesting that the adverse effects of CLO portfolio constraints seem to be priced –at least, to some extent– by CLO equity investors. Economically, an interquartile increase in CLO test restrictiveness decreases the trading price of the equity tranche by about 2.01% of its mean sample value.

In our third set of analyses, we attempt to identify possible mechanisms that link CLO test restrictiveness to lower CLO equity returns by focusing on the trading choices made by CLO managers. On the one hand, CLO test restrictiveness may discipline CLO managers' risk-taking activities. Managers will thus decrease risky loan investments and avoid frequent portfolio rebalancing to mitigate the likelihood of incurring a test violation (e.g., Helwege et al., 2016). On the other hand, more restrictive tests may place a higher hurdle on managers who need to achieve the necessary short-term performance to pass these tests. To do so, CLO managers may prefer trading strategies that offer short-term profits but sacrifice long-term investment performance.

We document that CLO test restrictiveness is associated with significantly greater portfolio turnover, greater loan trading volume, shorter loan holding periods (especially for loans whose market price is increasing), riskier loans purchases and lower buy-and-hold loan returns. This evidence indicates that managers of CLOs with more stringent constraints rebalance loan investments to a greater extent and more frequently. These managers also liquidate profitable investments sooner and purchase riskier new investments potentially destroying value for equity investors. Additional tests indicate that managers of CLOs with more restrictive tests adjust their investment and trading strategy to circumvent binding tests and that these adjustments have a detrimental effect on the distributions to the CLO equity tranche. We document that trading

activities of more constrained CLOs further decrease a CLO's equity returns.<sup>3</sup>

Finally, we find no statistically significant relation between CLO test restrictiveness and CLO credit risk as measured by the probability of a test violation (i.e., a low test score), the likelihood of a CLO note rating downgrade or the percentage of low-quality portfolio loans. This finding is consistent with the interpretation that CLO managers engage in greater short-term loan investments and portfolio rebalancing to alleviate default costs associated with test violations. More importantly, this evidence indicates that CLOs with more restrictive constraints do not seem to have a lower credit risk relative to CLOs with less restrictive constraints.

We make several important contributions to the literature. First, we add to the emerging literature on CLOs. This literature has mainly focused on the extent to which CLOs influence loan issuance and contract design. Benmelech, Dlugosz and Ivashina (2012) have investigated whether CLOs are associated with the issuance of riskier loans but could not find any material difference between the performance of loans securitized via CLOs and non-securitized loans, suggesting that adverse selection problems are less severe in syndicated loan lending. Bozanic, Loumiotis and Vasvari (2017) document that CLOs invest in loans with more standardized financial covenants while Becker and Ivashina (2016) find a strong association between the incidence of covenant-light loans and CLO's ownership of these loans, both suggesting that CLOs invest in loans with simpler covenant structures to decrease their information processing costs. Another interpretation of these results, consistent with the arguments in Stein (2013), is that CLOs forego control rights in loan contracts to boost loan yields which are more visible to CLO investors. Indeed, we document that loan yields are reflected in CLOs' tests (i.e., the loan income test) and CLO

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<sup>3</sup> CLO managers receive an incentive management fee when they pass a certain IRR rate for the equity tranche investors (typically, about 12%). This evidence suggests CLO manager's trading behavior does not likely result from the misalignment of interests between CLO managers and equity investors, but it is rather due to CLO constraints.

managers' focus on these test thresholds can negatively impact the returns to the CLO's equity holders. Consistent with our finding, Loumiotis and Vasvari (2018) document that managers make attempts to manipulate CLO's performance to meet capital tests regularly.

Second, we bring new insights to the asset management literature. Prior research on constraints imposed by investors on managers in mutual or hedge funds shows that investment policy restrictions such as limitations on short selling, borrowing or derivative use do not result in significant return differentials (e.g., Almazan et al, 2003) whereas investment incentives (instead of constraints) are indeed associated with better performance or higher returns (e.g., Agarwal, Daniel, and Naik, 2009). Our paper provides new evidence that adding stricter constraints on the portfolio of an asset manager results in inferior performance for the CLO equity tranche and this inferior performance is associated with value destroying trading activities.

Third, we contribute to the well-established debt covenant accounting literature which has primarily examined the impact of debt covenant restrictiveness on managerial activities. Few papers within the debt covenant literature have concluded that managers make accounting choices that increase earnings and cash flows (e.g. increasing working capital accruals) when firms are close to debt covenant violations (e.g., DeFond and Jiambalvo, 1994; Sweeney, 1994; Kim, 2009). Also, managerial financial decisions in response to potential covenant violations are stronger when the actions undertaken by existing creditors are more severe such as when they increase interest rates or add distribution lock-ups (Roberts and Sufi, 2009). Similarly, CLO managers exercise discretion in manipulating fair values or loan trading in response to restrictive capital tests (Loumiotis and Vasvari, 2018). We complement this work by showing that managerial actions to circumvent stricter CLO tests lower the returns to equity investors. More relevant to our findings, DeAngelo et al. (1994) find that covenant restrictions are responsible for almost all forced dividend

reductions thereby reducing the returns for equity holders. Our paper establishes this association in the context of CLOs.

## **2. Institutional background and CLO portfolio constraints**

Since their emergence in the 1990s, CLOs have played a significant role in the financing of leveraged buyouts and acquisition finance globally. However, following the subprime credit crisis, investors lost their confidence in structured finance vehicles leading to a drying up of the liquidity and issuance of new CLOs. Not surprisingly, the emerging regulatory framework (i.e., the Dodd-Frank Act and the Volcker Rule) has changed substantially the investing landscape for CLOs following the financial crisis. An important implication of the Volcker Rule was that CLOs were prohibited from owning bonds. Instead, they were required to own only loans given their lower credit volatility and higher recovery rates relative to similarly rated corporate bonds. In addition, as CLOs are generally thinly capitalized vehicles, US regulators (i.e., the Federal Reserve and SEC) required CLO managers to retain some “skin in the game” in order to ensure a better alignment of interests with their investors. Specifically, the Dodd-Frank Act (Section 941) enacted in 2010 required CLOs to retain 5% of the credit risk based on the value of a CLO’s liabilities (e.g., Coffey, 2015).<sup>4</sup>

While regulatory interventions aim to increase the alignment of interests between CLO managers and investors in CLO notes, CLO prospectuses negotiated by managers with investors in various CLO tranches provide additional features that increase alignment and provide credit protection. First, most CLOs provide managers a performance fee which is paid only when

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<sup>4</sup> This retention rule was subsequently challenged by the Loan Syndications and Trading Association (LSTA) given its arbitrary nature and repercussions on the growth of the CLO industry. The US Court of Appeals for the District of Columbia ruled in favor of LSTA in February 2018, allowing CLO managers not to comply with the US risk retention rules. Compliance with EU risk retention rules is still obligatory for European CLOs.



investors in the equity tranche achieve a minimum threshold internal rate of return (or “hurdle rate”), most commonly set at 12%.<sup>5</sup> This fee is in addition to the annual senior and subordinated management fees which combined are usually set at 50 bps of the total portfolio balance and are paid before the equity tranche receives cash distributions.<sup>6</sup> The performance fee aligns managers with investors in the equity tranche and provides managers with strong economic incentives to manage the loan portfolio to achieve good returns for the equity tranche. Second, CLOs improve credit enhancement levels by requiring a set of compliance tests that have to be met and reported each month. These tests provide an essential mechanism to detect and potentially correct a deterioration in the CLO’s portfolio quality. Previous empirical research has demonstrated that securitization and the potential lack of such tests in the context of subprime mortgages lead to lower lending standards which— in turn – resulted in lower quality portfolios (i.e., Keys, Mukherjee, Seru, and Vig, 2010; Nadauld and Sherlund 2009).

The most prominent CLO compliance tests are the *capital coverage* (or overcollateralization) *tests*. The capital coverage tests require that the ratio of the CLO’s loan portfolio value, scaled by the CLO notes’ principal balance, exceed a certain minimum threshold. A typical CLO issues both junior notes which are first to be affected by a decrease in the portfolio value and senior notes which incur losses only after the junior notes are wiped out. A CLO’s portfolio value is measured as the sum of five components: (1) The principal balance of all performing loans in the portfolio. These loans usually represent the majority of a CLO’s assets (i.e., more than 90% of portfolio loans). (2) The cash generated from trading activities and loan payments that sits on the balance

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<sup>5</sup> The incentive fee is typically set as an annual percentage of 0.125% of the CLO’s portfolio balance or 20% of the remaining funds, if any left, after the hurdle IRR to the equity holders is satisfied (e.g. Yan, 2012).

<sup>6</sup> The senior fees are paid after all the admin fees are paid but before any CLO debt tranches receive interest payments, while the subordinate fees are paid after all debt tranches are paid interest but before any cash is distributed to the equity tranche holders. The usual split between senior and subordinate fees is 15 bps/35 bps or 20 bps/30 bps.

sheet of the CLO and is expected to be reinvested in new loans or disbursed to noteholders. (3) The aggregate expected recovery of loans in default. Defaulted loans are loans that do not pay principal and/or interest, are D-rated or are issued by borrowers that filed for bankruptcy. The recovery values for these loans are computed as the lower of their fair values or the recovery values estimated by credit rating agencies such as S&P and Moody's. (4) The aggregate fair value of CCC-rated loans above the maximum CCC-rated loan balance that a CLO is allowed to hold in the portfolio.<sup>7</sup> (5) The aggregate purchase price of portfolio loans purchased at 80% - 85% of par value or below. These definitions are standardized across CLOs and explicitly described in CLO prospectuses.

A second test is the *interest coverage test* which ensures that the loan collateral pool generates adequate interest cash flows to service the interest on each type of CLO note. This test is the ratio of interest income received on the portfolio loans to interest payments due on a particular set of CLO notes at each payment date. The minimum subordinated note coverage ratios are generally set lower than the minimum mezzanine note coverage ratios, which are, in turn, set lower than the minimum senior coverage ratios. For this reason, subordinated notes coverage tests are breached earlier than mezzanine note coverage tests. The lower the minimum ratio required for any coverage test, the lower the amount of losses that will breach that test.

The *loan risk test* (also called the weighted average rating factor or WARF) is another test. To calculate the weighted average rating factor on a CLO loan portfolio, rating agencies must first determine the credit rating of each loan in the portfolio. This rating can range from extremely high credit quality (AAA) to low quality (CCC) or default (D). The letter rating corresponds to a

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<sup>7</sup> For traded loans, loan fair values are based on market prices retrieved from secondary loan market data providers such as Intex, Loan Pricing Corporation or Markit. For non-traded loans, CLO managers seek loan bids from usually three independent broker-dealers to determine the loans' fair values. If such bids cannot be obtained, CLO managers set the loan fair values themselves.

numerical rating factor, which in turn corresponds to the 10-year probability of default of a loan. To compute WARF, the notional balance of each loan is multiplied by the rating factor and then these values are summed. This sum is then divided by the total notional balance of the portfolio.

Finally, CLOs need to pass a *loan income test*, which is the average effective interest rate spread for the loan portfolio over an index rate such as LIBOR. This test ensures a minimum level of income from the underlying portfolio that should be sufficient to pay interest on the notes issued by the CLO.<sup>8</sup>

CLO trustees, typically banks, are mandated with the monthly monitoring of the CLO tests and to keep CLO note investors informed. Their main task consists of preparing monthly reports that provide information on CLO test compliance, collateral concentration limits, trading activity, and changes in loans' credit ratings. Many investors rely exclusively on the trustee reports to monitor the CLO's collateral quality thus emphasizing the importance of CLO manager diligence and oversight by the trustees.

Violation of the CLO tests has significant implications for CLO managers. If test violations are not resolved within an allowed cure period, which varies across CLO tests, then there are several consequences: (i) interest and principal cash flows are diverted from more junior tranches to pay down the CLO's liabilities in order of their seniority until the specific test is again in compliance, (ii) interest payments to more junior tranches are suspended and are used to purchase additional collateral, (iii) principal and interest payments cannot be reinvested to buy new leveraged loans, (iv) CLO notes are potentially downgraded by credit rating agencies, and (v) managers cannot receive the subordinated fees as well as performance-linked fees. Even though CLO test violations

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<sup>8</sup> Additional tests determine the portfolio's concentration on certain loans. These limitations relate to the portfolio's allocation to low-rated loans (e.g., a maximum percentage of CCC-rated loans), covenant-lite loans or loans issued from the same borrower or in the same borrower's industry (i.e., borrower and industry diversification). We attempt to control for CLO's performance on these tests across our multivariate tests.

have significant repercussions and require the CLO managers to trade loans actively within the portfolio in order to ensure test compliance, the worst-case scenario would occur when the CLO's performance triggers an Event of Default. Such an event typically happens when the OC test falls below a second threshold. In this scenario, the reinvestment period (typically five years) is terminated and all cash flows are used to repay all CLO notes in order of seniority.

### **3. Data methodology**

#### *3.1. Data*

We obtain loan-level data on CLOs' portfolio structure, performance, and trades from the Creditflux CLO-i database, which retrieves information from CLOs' monthly reports starting from January 2008. The CLO portfolio data includes loan-level information on loan types, maturity, face amount held, Moody's and S&P credit ratings, as well as borrowers' names and industries. The CLO monthly performance data covers the percentage of CCC-rated and defaulted loans in the CLO portfolio, as well as the slack and thresholds on the capital coverage, interest coverage, loan risk and loan income tests.<sup>9</sup> Moreover, CLO-i retrieves data on distributions to equity tranche investors from CLO payment reports on a quarterly basis. To match the different reporting frequency of CLO portfolio and performance data and CLO payments, we average portfolio and performance characteristics at the CLO-quarter level. Our sample covers complete data on the performance, portfolio structure and distributions of 1,255 U.S. CLOs (15,711 observations at the CLO-quarter level) over the 2008-2017 period. These CLOs are originated over the period 2000-2017.

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<sup>9</sup> CLO-i also covers data on the weighted average life (WAL) test that examines whether the average maturity of the underlying loan portfolio matches the maturity of CLO notes. We exclude this CLO test from our analyses, since its threshold varies every month, and CLO managers may not rebalance their portfolios on a monthly basis strictly to pass this test. Indeed, this test is violated for over 40% of our sample CLOs without any adverse consequences for the CLO manager and equity investors (untabulated summary statistic).

We examine CLOs' trading behavior by obtaining information on specific loans traded, trade dates, trade prices and face amount of the loan traded. There are 1,016,658 unique trades (loan sales and purchases) by 1,255 CLOs over the 2008-2017 period (all CLOs in our sample are actively managed). We match loan trade dates to the first CLO distribution quarter-end date following the loan trade date to estimate a quarterly loan portfolio rebalancing measure. Descriptive statistics on CLO origination, reporting and loan trading activity by year are summarized in Table 1.

We divide variables constructed from the portfolio, payment and performance CLO reports covered by CLO-i into CLO test restrictiveness variables, CLO equity returns and CLO portfolio characteristics variables, and variables describing the CLO trading activity. These variables are described in detail below.

### *3.2. Variable definitions*

#### *3.2.1. Measures of CLO test restrictiveness*

We focus on four important CLO tests: the minimum capital coverage test, the minimum interest coverage test, the maximum loan risk test, and the minimum loan income test. We measure the restrictiveness of each test by estimating a standardized score of how restrictive a CLO test threshold is relative to the sample distribution of this test threshold in other CLOs. To exemplify, we measure a CLO's capital coverage test restrictiveness by taking the difference between the capital coverage threshold specified in the CLO's prospectus and the minimum threshold of this test across all sample CLOs, scaled by the difference between the maximum and the minimum capital coverage test thresholds (*Capital coverage restrictiveness*). We employ the same methodology to measure the relative restrictiveness for the interest coverage test (*Interest coverage restrictiveness*) and the loan income test (*Income restrictiveness*). We assess the relative

restrictiveness of a CLO's loan risk test by taking the difference between the maximum loan risk threshold across all sample CLOs and the loan risk threshold in this CLO, scaled by the difference between the maximum and the minimum loan risk test thresholds (*Risk restrictiveness*). This measurement approach allows us to estimate a standardized average restrictiveness for each CLO test at the CLO level, despite the fact that the unit measurement of these tests and their distribution differ significantly.<sup>10</sup> Finally, we define *CLO test restrictiveness* as the mean value across the *Capital coverage*, *Income coverage*, *Risk* and *Income restrictiveness* variables. We provide detailed variable definitions in the Appendix.

Table 2 reports the summary statistics of the variables we use in the empirical analyses. The mean *CLO test restrictiveness* is about 0.45, with a mean *Capital coverage restrictiveness* and *Interest coverage restrictiveness* of 0.30 and 0.59 respectively. The mean *Risk restrictiveness* and *Income restrictiveness* is 0.52 and 0.46 respectively. Figure 1 presents the evolution of the CLO test restrictiveness variable computed for our sample of CLOs over time (we exclude years 2009 and 2010 as there were no CLOs being issued during these two years). Following the trend in the securitization market, CLOs originated before the credit crisis exhibit increasingly lax test thresholds until 2007, the year before the credit crisis developed. This pattern sharply reversed during the credit crisis and in the years immediately following the securitization market turmoil, when the constraints placed on CLOs became substantially stricter.

### 3.2.2. Measures of CLO equity returns and CLO performance characteristics

We measure CLO equity returns using the cash distributions a CLO makes to its equity

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<sup>10</sup> Our results are robust to using non-standardized measures for CLO test threshold restrictiveness (without averaging across all tests at the CLO level) and when we use indicator variables of whether the tests' thresholds of a CLO rank are in the upper quartile of the tests' threshold distribution, and zero otherwise (untabulated robustness tests). We further show that our results hold when we measure the tightness of CLO test thresholds relative to the initial CLO test scores upon a CLO's inception.

investors. *Equity returns* is the quarterly cash distributions to equity investors, defined as the ratio of the quarterly cash payments to CLO equity investors to the CLO equity tranche balance outstanding. The mean *Equity returns* is 4.77% (Table 2). Figure 1 shows CLOs' equity returns on a cash-flow basis by the year of CLOs' origination. There is a negative correlation between the equity returns of a CLO and the restrictiveness of the CLO tests. This conclusion is further supported by Figure 2 where we split the sample of CLOs into three groups based on the level of the CLO test restrictiveness. CLOs with the highest CLO test restrictiveness pay quarterly equity returns of about 4.5% while CLOs with the lowest restrictiveness return about 5.2%.

We further include several CLO performance and portfolio characteristics in our multivariate analyses that likely affect CLO equity returns. We control for CLO riskiness and portfolio quality using: the percentage of defaulted (*Default bucket*) and CCC-rated (*CCC-rated bucket*) loans in a CLO portfolio; the average rating of the CLO tranches (*CLO tranche rating*), where a loan's rating is defined as a discrete variable that takes the value of 1 for AAA (or Aaa), 2 for AA+ (or Aa1), and so forth; indicator variables of whether a CLO violates in a quarter its capital coverage test (*Capital coverage violation*), interest coverage test (*Interest coverage violation*), income test (*Income test violation*) and risk test (*Risk test violation*); and the natural logarithm of the CLO's total principal balance outstanding (*CLO size*). The average CLO size is about \$490 million. The mean percentage of defaulted (CCC-rated) CLO loans is about 3.00% (6.00%), and the mean CLO note rating is about 5 or A. The mean likelihood of a CLO test violation is relatively low (e.g., the average CLO has violated the capital coverage test in only about 5% of its reporting quarters), with the risk test being the one that is most commonly violated (e.g., an average CLO has violated the risk test in about 25% of its reporting quarters). In addition, we control for the influence of CLO noteholders using the average CLO note coupon (*Average note coupon*); the CLO junior note

principal balance outstanding to CLO senior note principal balance outstanding (*Junior to senior note principal balance*); and the number of CLO tranche categories (e.g., senior, senior subordinated, junior subordinated, mezzanine etc.) issued by the CLO (*CLO tranche slicing*). The mean CLO note coupon is 1.14%, the mean percentage of junior CLO tranches is 19.00%, and the mean number of note types issued by a CLO is about 8. Last, we use the natural logarithm of days to maturity (*Days to maturity*) and whether a CLO is originated after the financial crisis using an indicator variable of whether a CLO is originated post 2012 (*Originated post 2012*) to control for intertemporal differences in CLO equity returns and different CLO structural features. The mean *Days to maturity* is about 7 years (with a mean logarithmic transformation of 8), and the majority of our sample CLOs are originated prior to the financial crisis.

### 3.2.3. Measures of CLO trading activity

We employ a battery of proxies to examine a CLO manager's trading behavior. First, we measure CLO portfolio turnover using the quarterly total balance of loans purchased by a CLO minus the total balance of loans sold by a CLO in the same quarter, scaled by the CLO's total principal balance outstanding (*Portfolio turnover*). Also, *High trading volume* is an indicator variable of whether a CLO's quarterly trading volume ranks in the upper quartile of trading volume, and zero otherwise. Trading volume is defined as the total balance of loans purchased and sold by a CLO over a quarter, divided by a CLO's total principal balance outstanding.

Second, we assess a CLO's loan reinvestment strategy by the difference between the quarter a CLO sells a loan minus the quarter a CLO purchases the same loan, averaged at the CLO-quarter of loan sales (*Avg. loan holding period*), and the difference between the holding period (in quarters) of loans whose price decreased over the holding period minus the holding period of loans whose price increased, averaged at the CLO-quarter of loan sale (*Avg. holding period of loans with*



(*price decrease -price increase*)). Moreover, we employ the CLO's buy-and-hold returns on its portfolio loans, averaged at the CLO-quarter of loan sales (*Loan returns*).

Third, we measure the riskiness of CLO portfolio turnover using the difference between the quarterly average credit rating of loans sold by a CLO minus the average credit rating of loans purchased by a CLO in the same quarter (*Credit risk of loan sales -credit risk of loan purchases*). The average CLO rebalances about 3% of its portfolio per quarter and holds a loan for about 15 months in its portfolio, earning, on average, a 33.00% buy-and-hold return. A CLO is likely to retain price-increasing and price-decreasing loans for about the same period on average, as well as sell off riskier loans to buy better-quality ones (i.e., the average CLO sells loans with lower credit ratings and buys loans with higher credit ratings).

#### **4. Research design and empirical results**

##### *4.1. CLO test restrictiveness, CLO characteristics and CLO note coupon*

We first examine CLO characteristics that are related to the CLO test restrictiveness. We use an OLS model, where the dependent variable is the mean CLO test restrictiveness (*CLO test restrictiveness*):

$$\begin{aligned}
 \text{CLO test restrictiveness} = & \alpha + \beta_1 \text{ Junior to senior bond original balance} + \beta_2 \text{ CLO original size} \\
 & + \beta_3 \text{ CLO tranche slicing} + \beta_4 \text{ CLO maturity} \\
 & + \beta_5 \text{ Originated post 2012} + \beta_6 \text{ CLO original tranche rating} \\
 & + \text{CLO manager FE} + \text{CLO arranger FE}
 \end{aligned}
 \tag{Model 1}$$

The analysis is at the CLO level and CLO characteristics are measured at CLO's inception. The variables are described in detail in the Appendix. We further include CLO manager (93 unique managers) and arranging bank fixed effects (20 unique arrangers) in the analyses to control for CLO managers' and arranging banks' unique features (e.g., style, skills) that may determine how strict the CLO test thresholds are set. Standard errors are clustered at the CLO level.

We report the tests of the analyses in Table 3, Panel A. In column (I), we find that small-sized CLOs and CLOs with shorter maturities have more restrictive tests, potentially because restrictive test thresholds compensate for the fact that managers of CLOs that are small and have short maturities are likely to have a lower reputation in the market and less experience. Moreover, CLO test restrictiveness is positively related to the volume of junior notes issued by a CLO, suggesting that test restrictiveness likely serves as a protection mechanism to investors whose returns are more vulnerable to CLO portfolio losses. Although we find a statistically significant and positive coefficient on the variable *CLO original tranche rating*, i.e., CLOs with lower-rated notes have more restrictive tests, this association is not economically significant: an interquartile increase in *CLO original tranche rating* increases *CLO test restrictiveness* by about 0.36% of its mean value in the sample. Last, CLOs issued after the recent credit crisis have tests that are more restrictive on average. In columns (II)-(V), we show that these findings hold for most CLO test categories. We note that the inverse results documented for *Risk restrictiveness* are driven by the fact that this test is technically the inverse of the *Income restrictiveness* and the other tests. When a CLO is restricted on the proportion of risky loan investments that it can hold, the loan income test threshold is mechanically lower as less risky loans pay lower spreads.

Furthermore, we examine the relation between *CLO test restrictiveness* and the coupon premium offered to junior noteholders relative to the one paid on senior tranches. We augment Model 1 with the *CLO test restrictiveness* variable and use as the dependent variable the difference between a CLO's junior note coupon and the senior note coupon, scaled by the senior note coupon (*Junior coupon premium*). All other control variables and model specifications are the same as in Model 1. We report the results of this test in Panel B of Table 3. We find a negative and statistically significant coefficient on *CLO test restrictiveness* (column I), consistent with junior noteholders

trading off cash flow rights (lower note coupons relative to the coupons on senior notes) for greater control rights (tighter CLO tests). This finding applies to most CLO test categories (column II-V). In untabulated analyses, we find no relation between *CLO test restrictiveness* and the average CLO coupon rate, suggesting that CLO test restrictiveness is unlikely to be driven by the CLOs' portfolio credit risk. Overall, our empirical evidence in this section suggests that the presence of junior investors rather than underlying risk likely influences CLO test threshold levels.

#### 4.2. *CLO test restrictiveness and CLO equity returns*

In our second set of analyses, we explore whether restrictive portfolio tests affect the subsequent returns received by the CLO equity tranche investors. We use an OLS model, where the dependent variable is the quarterly CLO equity returns on a cash-flow basis (*CLO equity returns*).

$$\begin{aligned}
 \text{CLO equity returns} = & \alpha + \beta_1 \text{CLO test restrictiveness} + \beta_2 \text{CCC-rated bucket} + \beta_3 \text{Default bucket} \\
 & + \beta_4 \text{CLO tranche rating} + \beta_5 \text{Average note coupon} \\
 & + \beta_6 \text{Junior to senior bond principal balance} \\
 & + \beta_7 \text{CLO tranche slicing} + \beta_8 \text{Capital coverage test violation} \\
 & + \beta_9 \text{Interest coverage test violation} + \beta_{10} \text{Risk test violation} \\
 & + \beta_{11} \text{Income test violation} + \beta_{12} \text{Originated post 2012} \\
 & + \beta_{13} \text{Days to maturity} + \beta_{14} \text{CLO size} + \text{CLO manager FE} \\
 & + \text{CLO arranger FE} + \text{Year FE}
 \end{aligned}
 \tag{Model 2}$$

We run this analysis at the CLO-quarter level. All variables in Model 2 are described in detail in the Appendix. We further include year, CLO manager (93 unique managers) and arranging bank fixed effects (20 unique arrangers) in the analyses. These fixed effects control for time-varying changes in market conditions, CLO managers' and arranging banks' unique features (e.g., reputation, style, expertise) that may influence CLO equity returns. We cluster the standard errors at the CLO level.

We report the tests of the analyses in Table 4. We find a negative and statistically significant coefficient on *CLO test restrictiveness* (column I), suggesting that CLOs with more restrictive tests

offer on average lower quarterly returns to their equity investors. Economically, an interquartile increase in *CLO test restrictiveness* decreases quarterly CLO equity returns by about 8.10% of the mean value of the dependent variable. These results hold for almost all CLO test categories (columns II-VI).

In terms of the coefficients on the control variables, we find that CLOs that experience more loan defaults, have a larger CCC-rated loan bucket or fail to pass the CLO test thresholds offer on average lower CLO equity returns, consistent with a deterioration in CLO portfolio quality primarily affecting the distributions to CLO equity investors. Moreover, high CLO coupon rates negatively affect CLO equity returns, while larger CLOs or CLOs with greater volume of junior notes experience higher equity returns, potentially because these CLOs are more reputable or more attentive to CLO portfolio quality so that they deliver higher performance to their CLO junior noteholders.

We next examine whether this negative association between *CLO test restrictiveness* and CLO equity returns is priced by CLO noteholders and equity investors. We augment Model 2 using as a dependent variable the natural logarithm of the trading price of a CLO note (equity) tranche (*CLO note price* [*CLO equity price*]). We control for the natural logarithm of the CLO note (equity) tranche principal balance traded (*CLO bond tranche amount traded* [*CLO equity tranche amount traded*]), the average credit rating of the CLO note tranches traded (*Rating of CLO note tranche traded*) and CLO tranche seniority fixed effects. All other control variables and model specifications are the same as in Model 2.

We report the results of the tests in Table 5. We find that CLO note pricing is greater for CLOs with more restrictive tests (column I and II), however, the results are not economically significant. An interquartile increase in *CLO test restrictiveness* increases *CLO note price* by about 0.30% of

the mean value of the dependent variable. In contrast, despite the significant drop in sample size due to the fact that the CLO equity tranche is relatively illiquid, we find a negative and statistically significant coefficient on *CLO test restrictiveness* when the dependent variable is *CLO equity price* (columns III-IV). Economically, an interquartile increase in *CLO test restrictiveness* decreases *CLO equity price* by about 2.01% of the mean value of the dependent variable. The results are driven by the capital coverage and the risk restrictiveness tests. Overall, our evidence suggests that CLOs with more restrictive tests offer lower distributions on a cash-flow basis to CLO equity investors, and this adverse effect seems to be priced –at least, to some extent– by CLO equity investors in the secondary market where these claims are traded.

#### *4.3. CLO test restrictiveness, CLO equity returns and CLO trading activities*

In our third set of analyses, we attempt to identify possible mechanisms that link CLO test restrictiveness to lower CLO equity returns. Focusing on trading choices made by CLO managers, on the one hand, CLO test restrictiveness may discipline managers' risk-taking activities, i.e., CLO managers may decrease risky loan investments and avoid frequent portfolio rebalancing to alleviate the likelihood of incurring a test violations. Thus, the presence of restrictive CLO tests can be associated with lower portfolio volatility and risk, which are associated with lower CLO equity returns. On the other hand, CLO managers may strive to meet the test thresholds on a monthly and quarterly basis. As a result, the tests' restrictiveness may incentivize them to achieve the necessary short-term performance to pass these tests. To do so, CLO managers may trade loans excessively to achieve short-term profits while sacrificing long-term investment performance. For instance, CLO managers could purchase risky loans that offer high income but are more likely to default in the long term. Alternatively, managers could sell loans whose prices has appreciated to cash gains. Holding these well-performing loans for longer periods will not allow managers to

realize their investment gains to pass regular binding tests. In contrast, CLO managers facing laxer portfolio tests are less likely to trade on the intertemporal volatility in the performance of the loans thus being able to hold well-performing loans for longer periods.

To examine the relation between CLO test restrictiveness and CLO trading activities, we employ Model 2 using as dependent variables the trading activity measures described in Section 3.2.3. All other model specifications and control variables are the same as in Model 2. We report the results of these tests in Table 6. In columns I and II, we find a positive and statistically significant coefficient on *CLO test restrictiveness*, suggesting that CLOs with more restrictive tests exhibit higher portfolio turnover and greater trading volume. Economically, an interquartile increase in *CLO test restrictiveness* increases *Portfolio turnover* and *High trading volume* by about 17.00% and 14.00% of the mean value of the dependent variables, respectively. Relatedly, CLOs with more restrictive tests hold portfolio loans for shorter time-periods indicating that their managers are pursuing shorter investment horizons (column III). Economically, an interquartile increase in *CLO test restrictiveness* decreases *Avg. loan holding period* by about 2.00% of the mean value of the dependent variable (i.e., by about 12 days). Importantly, we find that the greater portfolio turnover is not driven by CLO managers trying to dispose low-quality loans.<sup>11</sup> In columns IV and V, we show that CLOs with more restrictive tests are likely to sell well-performing loans faster (i.e., loans whose market price appreciates over time) relative to underperforming loans (i.e., loans whose market price has decreased below the purchase price). Economically, an interquartile increase in *CLO test restrictiveness* increases the *Avg. holding period of loans with (price decrease -price increase)* by about 26.00% (i.e. by about 24 days).

Consistent with this trading behavior destroying value, we document that the average buy-and-

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<sup>11</sup> Sample size drops because the complete holding period is not available for all portfolio loans, i.e. many portfolio loans were purchased or sold by CLOs outside our sample period.

hold loan portfolio returns are significantly lower for CLOs with restrictive tests (see column V): an interquartile increase in *CLO test restrictiveness* decreases the *Loan returns/profits* by about 11.00%, which represents 33.00% of the mean value of the dependent variable. In addition, we show that CLO test restrictiveness is positively associated to the riskiness of loans purchased by a CLO relative to the riskiness of loans sold by the CLO (column VI). Economically, an interquartile increase in *CLO test restrictiveness* decreases *Credit risk of loan sales -credit risk of loan purchases* by about 16.00% of the mean value of the dependent variable. Our findings are robust to examining the association between the restrictiveness of individual CLO test categories and CLOs' trading activities (untabulated tests).

Overall, the evidence indicates that CLO managers who face more restrictive constraints rebalance their loan investments to a greater extent and more frequently, liquidate their profitable investments sooner and purchase riskier new investments to circumvent these binding tests. Our findings are consistent with the interpretation that these CLO managers change their investment and trading strategy to meet these tests and that this strategy has a detrimental effect on the returns received by the CLO equity tranche.

To provide additional evidence on the effect of the trading choices by CLOs with more restrictive tests on CLO equity returns, we augment Model 2 with the measures of CLO trading activities and their interaction terms with *CLO test restrictiveness*. All other model specifications and control variables are the same as in Model 2. In Table 7, we show that while CLO trading activities on average improve CLO equity returns, trading activities by CLOs with restrictive tests adversely affect the distributions to CLO equity investors. An interquartile increase in *Portfolio turnover* increases *CLO equity returns* by about 5.60% of the mean value of the dependent variable. However, when a CLO tests' restrictiveness ranks in the upper quartile of the variable

distribution, an interquartile increase in *Portfolio turnover* decreases *CLO equity returns* by about 3.00% of the mean value of the dependent variable. These findings provide further support on the adverse effects of trading activities by CLOs with more restrictive tests on the CLO distributions to the equity tranche.

#### 4.4. Supplemental analyses

In supplemental analyses, we examine whether our lower equity return results are driven by the higher likelihood of more constrained CLOs defaulting on their tests or exhibiting lower portfolio credit performance. It is possible that the CLO test restrictiveness may be correlated with an unobservable inherent risk factor of the CLO that also suppresses CLO equity returns. To alleviate this concern, we employ Model 2 using as dependent variables measures of CLO's ex-post performance. The first dependent variable, *CLO test slack*, is the average standardized slack across CLO tests (capital coverage, interest coverage, income and risk). We measure the slack of a test by computing the percentage difference between the CLO test score and the CLO test threshold (CLO test threshold minus the CLO test score for a particular portfolio test). We then standardize this difference based on the distribution of this variable. The second dependent variable, *Probability of 5% CLO test slack*, is an indicator variable of whether the slack of a CLO test is between 0% and 5%, and zero otherwise. The third dependent variable, *CLO tranche rating downgrade*, is an indicator variable of whether a CLO tranche has been downgraded by at least one notch since previous quarter, and zero otherwise. Finally, *Default bucket (CCC-rated bucket)* is defined as the percentage of defaulted (CCC-rated).<sup>12</sup>

We present the results of these tests in Table 8. Across all specifications, we fail to find a

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<sup>12</sup> For specifications where *CLO test slack* and *Probability of 5% CLO test slack*, are used as the dependent variables, the CLO test violation variables are excluded from the control variables. For specifications where *Default bucket (CCC bucket)* is the dependent variable, the variable *Default bucket (CCC bucket)* is excluded from the control variables. All other model specifications and control variables are the same as in Model 2.



statistically significant coefficient on *CLO test restrictiveness*, consistent with the argument that CLOs with more restrictive tests are not inherently riskier. This evidence provides further support that CLO managers engage in short-term trading strategies that alleviate the default costs associated with portfolio test violations. Importantly, these findings further suggest that CLO test restrictiveness does not seem to directly benefit CLO noteholders either, since constrained CLOs do not exhibit on average superior credit performance or lower ex-post credit risk.

We also investigate whether our results are robust to an alternative measure of CLO test restrictiveness. Following Demiroglu and James (2010), we measure CLO test restrictiveness by how close a test threshold is set relative to the level of the test score at the inception of the CLO. Focusing on CLOs originated post 2009, we measure the initial slack of the capital coverage, interest coverage, risk and income test by the ratio by computing the difference between the test score up to one quarter post CLO origination and the test threshold set in the CLO prospectus scaled by the test threshold.<sup>13</sup> We then average these initial slack across all portfolio tests. We define *Lax CLO test restrictions upon origination* as an indicator variable that takes the value one if a CLO's initial average test slack is ranked in the upper quintile of the distribution, and zero otherwise. We employ Model 2 where *Lax CLO test restrictions upon origination* is the measure of CLO test restrictiveness and the primary independent variable of interest. All other model specifications and control variables are the same as in Model 2. We present the results of these tests in Table 9. We find that the results of our primary analyses remain unchanged, suggesting that our findings are unlikely to be driven by our measurement choices for CLO test restrictiveness.<sup>14</sup>

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<sup>13</sup> Sample size drops because test scores upon CLO origination are not available for all CLOs in our sample. The restricted sample for this test includes 311 unique CLOs.

<sup>14</sup> Our results are also robust to using annualized equity returns on a cash-flow basis (untabulated tests).

## 5. Conclusion

We explore whether the restrictiveness of portfolio constraints imposed on CLOs upon their origination predicts future CLO equity returns. We focus on the restrictiveness of key CLO tests that determine the minimum capital and interest coverage on CLO notes, the minimum interest income from portfolio loans' interest payments and maximum portfolio riskiness (i.e., minimum average rating of portfolio loans). We find that CLOs that are small, are originated after the credit crisis and raise more capital from junior noteholders have more restrictive CLO test thresholds.

Looking at CLO's distributions to the equity tranche (i.e., realized equity returns on a cash-flow basis), we show that CLOs with more restrictive test thresholds offer lower returns to their equity-holders. Consistent with this finding, we find some evidence that the CLO constraints are priced negatively when CLO equity tranches are traded. We also examine CLO managers' trading activities that likely contribute to the lower CLO equity returns. We document that CLOs with more restrictive portfolio tests exhibit higher portfolio turnover and greater trading volume, are more likely to hold loans for shorter periods, liquidate profitable loan investments more quickly to cash the gains and achieve lower buy-and-hold loan returns relative to CLOs with laxer test thresholds. Our findings are consistent with the interpretation that CLO managers facing restrictive constraints adopt more short-term oriented investment strategies to meet these tests, thus negatively impacting the CLO equity returns. Last, we show that our results are unlikely to be driven by the fact that CLOs with tighter constraints might face higher credit risks.

Our findings provide new insights into the consequences of CLOs' structural features that are determined upon their origination. In particular, we show that strict portfolio constraints are associated with lower future expected returns. We acknowledge that our findings preclude us from drawing conclusions on the optimality of the CLO managers' trading behavior, since CLO equity

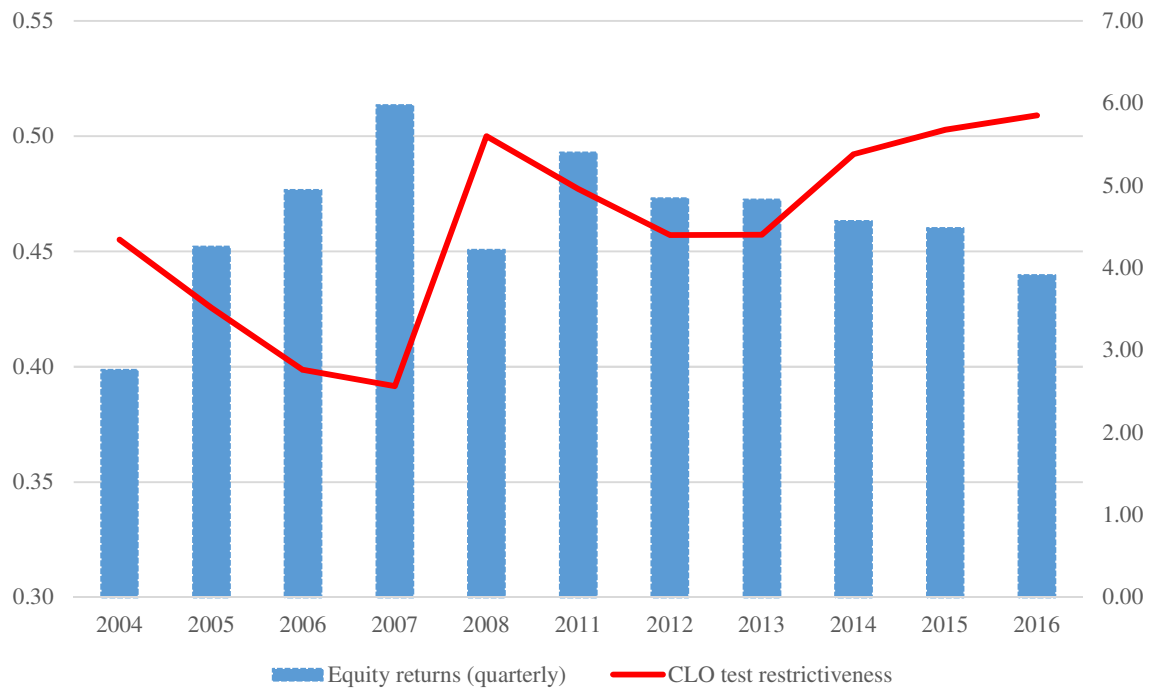
returns could be even lower if CLO managers do not adopt active short-term loan trading strategies to meet the monthly portfolio tests and instead allow the CLO to violate these tests. Moreover, our data availability restricts us from examining whether equity ownership by the CLO manager can mitigate the adverse effects of CLO portfolio constraints. More research is required to understand the role of CLOs' structural features on CLO investors' returns and CLO managers' trading strategies.

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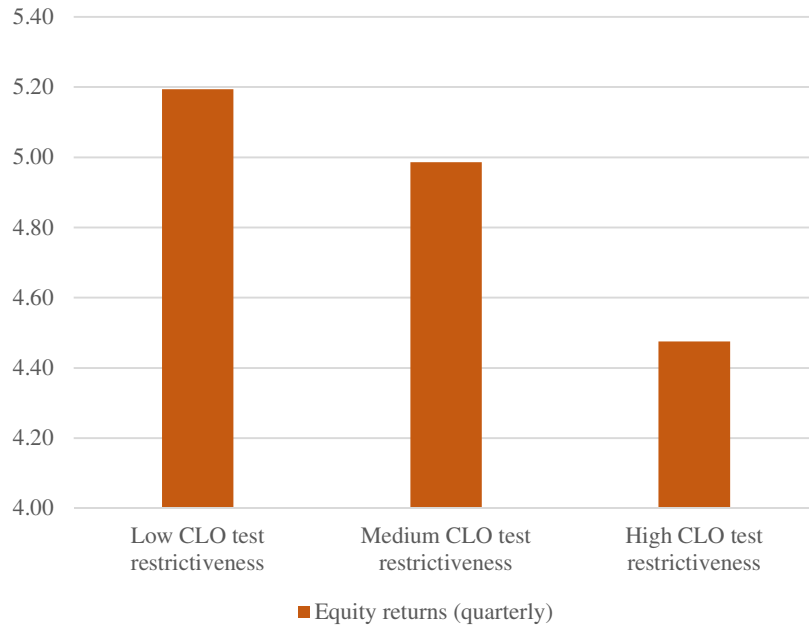
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**Figure 1. CLO test restrictiveness and quarterly equity returns by year of CLO origination**



The figure presents the restrictiveness of CLO tests (primary y-axis) and the percentage of quarterly CLO equity returns on a cash-flow basis (secondary y-axis) by year of CLO origination over the period 2004-2016. There are no CLOs originated in 2009, and only one CLO was issued in 2010, thus, these two years are omitted.

**Figure 2. Quarterly equity returns by CLO test restrictiveness**



The figure presents the average quarterly CLO equity returns on a cash-flow basis by tercile of test restrictiveness of our sample CLOs.

## APPENDIX

### *Variable definition*

<b>Variable</b>	<b>Definition</b>
<b><u>CLO test restrictiveness</u></b>	
<i>Capital coverage restrictiveness</i>	The standardized measure for a CLO's minimum senior or junior note capital coverage (overcollateralization) test restrictiveness, defined as: $[\text{CLO's capital threshold} - \text{Min}(\text{Capital threshold}) / \text{Max}(\text{Capital threshold}) - \text{Min}(\text{Capital threshold})]$ .
<i>Interest coverage restrictiveness</i>	The standardized measure for a CLO's minimum senior or junior note interest coverage test restrictiveness, defined as: $[\text{CLO's interest threshold} - \text{Min}(\text{Interest threshold}) / \text{Max}(\text{Interest threshold}) - \text{Min}(\text{Interest threshold})]$ .
<i>Risk restrictiveness</i>	The standardized measure for a CLO's maximum average portfolio loans' credit rating test restrictiveness, defined as: $[\text{Max}(\text{Risk threshold}) - \text{CLO's risk threshold} / \text{Max}(\text{Risk threshold}) - \text{Min}(\text{Risk threshold})]$ .
<i>Income restrictiveness</i>	The standardized measure for a CLO's minimum average portfolio loan spread test (income test) restrictiveness, defined as: $[\text{CLO's income threshold} - \text{Min}(\text{Income threshold}) / \text{Max}(\text{Income threshold}) - \text{Min}(\text{Income threshold})]$ .
<i>CLO test restrictiveness</i>	The mean of <i>Capital coverage</i> , <i>Income coverage</i> , <i>Risk</i> and <i>Income restrictiveness</i> .
<b><u>CLO equity returns</u></b>	
<i>Equity returns</i>	The percentage of quarterly dividends to equity holders divided by the CLO equity par value.
<b><u>Equity and note pricing</u></b>	
<i>CLO note price</i>	The natural logarithm of the trading price of a CLO senior or junior note tranche, averaged at the CLO tranche-quarter level.
<i>CLO equity price</i>	The natural logarithm of the trading price of a CLO equity tranche, averaged at the CLO tranche-quarter.
<i>CLO note tranche amount traded</i>	The natural logarithm of CLO note tranche principal balance traded, averaged at the CLO tranche-quarter.
<i>CLO equity tranche amount traded</i>	The natural logarithm of CLO equity tranche principal balance traded, averaged at the CLO tranche-quarter.
<i>Rating of CLO note tranche traded</i>	The credit rating of CLO note tranche traded, averaged at the CLO tranche-quarter level. CLO tranche rating is a scale variable equal to 1 if the rating is AAA, 2 if AA+, and so forth.



## APPENDIX (Continued)

### Trading activities

<i>Portfolio turnover</i>	The quarterly total balance of loans purchased by a CLO minus the total balance of loans sold by a CLO in the same quarter, divided by a CLO's total principal balance outstanding.
<i>High trading volume</i>	Binary variable equal to one if a CLO's quarterly trading volume ranks in the upper quartile of trading volume, and zero otherwise. Trading volume is defined as the total balance of loans purchased and sold by a CLO over a quarter, divided by a CLO's total principal balance outstanding.
<i>Avg. loan holding period</i>	The difference between the quarter a CLO sells a loan minus the quarter a CLO purchased the same loan, averaged at the CLO-quarter of loan sale.
<i>Avg. holding period of loans with (price decrease -price increase)</i>	The difference between the holding period of loan whose price decreased over the holding period minus the holding period of loan whose price increased, averaged at the CLO-quarter of loan sale.
<i>Loan returns/profits</i>	Returns that a CLO generates for buying and selling a loan, averaged at the CLO-quarter of sales level. Returns are defined as: $(\text{Balance of loan sold} * \text{Sale price} - \text{Balance of loan purchased} * \text{Purchase price}) / (\text{Balance of loan purchased} * \text{Purchase price})$ .
<i>Credit risk of loan sales -credit risk of loan purchases</i>	The difference between the the quarterly average credit rating of loans sold by a CLO minus the average credit rating of loans purchased by a CLO in the same quarter. Loan rating is a scale variable equal to 1 if the loan rating is AAA, 2 if AA+, and so forth.

### CLO performance & characteristics (at the CLO-quarter level)

<i>CCC bucket</i>	The principal balance of CCC-rated CLO portfolio loans to CLO total principal balance outstanding.
<i>Default bucket</i>	The principal balance of defaulted CLO portfolio loans to CLO total principal balance outstanding.
<i>CLO tranche rating</i>	The mean credit rating of CLO tranches. CLO tranche rating is a scale variable equal to 1 if the rating is AAA, 2 if AA+, and so forth.
<i>Average note coupon</i>	Average coupon rate of the CLO senior and junior note tranches.
<i>Junior to senior note principal balance</i>	CLO junior note principal balance outstanding to CLO senior note principal balance outstanding.
<i>Capital coverage test violation</i>	Binary variable equal to one if a CLO violated the senior or junior capital coverage test threshold, and zero otherwise.

## APPENDIX (Continued)

<i>Interest coverage test violation</i>	Binary variable equal to one if a CLO violated the senior or junior interest coverage test threshold, and zero otherwise.
<i>Risk test violation</i>	Binary variable equal to one if a CLO violated the risk test threshold, and zero otherwise.
<i>Income test violation</i>	Binary variable equal to one if a CLO violated the income test threshold, and zero otherwise.
<i>Originated post 2012</i>	Binary variable equal to one if the CLO is originated post 2012 (i.e., when the managers of new CLOs are required to abide by risk-retention rules), and zero otherwise.
<i>Days to maturity</i>	The natural logarithm of days till the CLO matures (for CLOs that are called early by their investors, the variable is defined as the natural logarithm of days till the CLO is called).
<i>CLO size</i>	The natural logarithm of CLO total principal balance outstanding.
<b><u>CLO performance &amp; characteristics (at the CLO level)</u></b>	
<i>Junior coupon premium</i>	CLO junior note coupon minus senior note coupon, divided by senior note coupon.
<i>CLO maturity</i>	The natural logarithm of CLO maturity in years
<i>CLO original tranche rating</i>	The mean credit rating of CLO tranches upon CLO origination. CLO tranche rating is a scale variable equal to 1 if the rating is AAA, 2 if AA+, and so forth.
<i>Originated post 2012</i>	Binary variable equal to one if the CLO is originated post 2012 (i.e., when the managers of new CLOs are required to abide by risk-retention rules), and zero otherwise.
<i>CLO tranche slicing</i>	The number of CLO tranches issued by the CLO.
<i>Junior to senior CLO note original balance</i>	CLO junior note principal balance to CLO senior note principal balance at CLO origination.
<i>CLO equity balance</i>	CLO junior note principal balance to CLO senior note principal balance at CLO origination.
<i>CLO original size</i>	The natural logarithm of CLO total principal balance upon origination.

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**TABLE 1***Sample statistics*

<b>Year</b>	<b>(I) Number of unique CLOs</b>	<b>(II) Number of CLO-quarter observations</b>	<b>(III) Number of loan trades</b>
2008	194	494	8,612
2009	224	888	48,769
2010	329	1,133	75,917
2011	350	1,312	76,522
2012	348	1,258	52,317
2013	422	1,381	57,332
2014	547	1,674	74,834
2015	699	2,349	139,214
2016	725	2,498	207,493
2017	878	2,724	275,638

This table presents the number of unique CLOs per reporting year (column I), the number of CLO-quarter observations in our sample per reporting year (column II), and the number of unique loan trades (sales and purchases) by CLOs per reporting year (column III).

**TABLE 2***Descriptive statistics***Panel A: Summary statistics of variables used at the CLO-level analyses on the relation between CLO test and CLO characteristics**

<b>Variable</b>	<b>Obs.</b>	<b>Mean</b>	<b>S.D.</b>	<b>Q2</b>	<b>Median</b>	<b>Q3</b>
<i>CLO test restrictiveness</i>	1,255	0.45	0.08	0.41	0.46	0.52
<i>Capital coverage restrictiveness</i>	1,255	0.30	0.19	0.23	0.33	0.45
<i>Interest coverage restrictiveness</i>	1,255	0.59	0.13	0.52	0.59	0.65
<i>Risk restrictiveness</i>	1,255	0.52	0.20	0.34	0.47	0.60
<i>Income restrictiveness</i>	1,255	0.46	0.20	0.30	0.49	0.57
<i>Junior coupon premium</i>	1,255	9.20	5.34	5.95	8.40	11.78
<i>CLO maturity</i>	1,255	2.52	0.17	2.43	2.56	2.64
<i>CLO original tranche rating</i>	1,255	5.16	1.72	4.50	5.33	6.20
<i>Originated post 2012</i>	1,255	0.63	0.48	0.00	1.00	1.00
<i>CLO tranche slicing</i>	1,255	8.18	2.11	7.00	8.00	9.00
<i>Junior to senior note original balance</i>	1,255	0.18	0.07	0.12	0.17	0.23
<i>CLO equity balance</i>	1,255	0.10	0.05	0.08	0.10	0.13
<i>CLO original size</i>	1,255	20.23	0.45	19.84	20.15	20.54

**Panel B: Summary statistics of variables used at the CLO-quarter level analyses on the relation between CLO tests and CLO equity returns and trading activities**

<b>Variable</b>	<b>Obs.</b>	<b>Mean</b>	<b>S.D.</b>	<b>Q2</b>	<b>Median</b>	<b>Q3</b>
<i>Equity returns</i>	15,711	4.77	2.97	2.73	4.58	6.43
<i>CLO test restrictiveness</i>	15,711	0.44	0.07	0.38	0.43	0.48
<i>Capital coverage restrictiveness</i>	15,711	0.27	0.17	0.13	0.22	0.36
<i>Interest coverage restrictiveness</i>	15,711	0.59	0.12	0.52	0.59	0.65
<i>Risk restrictiveness</i>	15,711	0.54	0.20	0.39	0.54	0.70
<i>Income restrictiveness</i>	15,711	0.35	0.20	0.19	0.31	0.52
<i>CCC bucket</i>	15,711	0.06	0.05	0.03	0.05	0.08
<i>Default bucket</i>	15,711	0.03	0.09	0.00	0.01	0.02
<i>CLO tranche rating</i>	15,711	5.48	2.10	5.00	5.44	6.00
<i>Average note coupon</i>	15,711	1.14	0.74	0.47	0.67	1.94
<i>Junior to senior note principal balance</i>	15,711	0.19	0.07	0.10	0.15	0.22
<i>CLO tranche slicing</i>	15,711	8.18	2.07	7.00	8.00	9.00
<i>Capital coverage CLO test violation</i>	15,711	0.05	0.23	0.00	0.00	0.00
<i>Interest coverage CLO test violation</i>	15,711	0.02	0.14	0.00	0.00	0.00
<i>Risk CLO test violation</i>	15,711	0.25	0.43	0.00	0.00	0.00
<i>Income CLO test violation</i>	15,711	0.07	0.25	0.00	0.00	0.00
<i>Originated post 2012</i>	15,711	0.41	0.49	0.00	0.00	1.00
<i>Days to maturity</i>	15,711	7.99	0.46	7.72	8.00	8.22

**TABLE 2 (Continued)**

<i>CLO size</i>	15,711	19.74	1.06	19.60	19.89	20.10
<i>Portfolio turnover</i>	15,711	0.03	0.08	0.00	0.03	0.07
<i>High trading volume</i>	15,711	0.26	0.47	0.00	0.00	1.00
<i>Avg. loan holding period</i>	11,458	5.28	1.50	4.86	5.62	6.18
<i>Avg. holding period of loans with (price decrease -price increase)</i>	11,458	0.00	2.41	-1.30	0.13	1.46
<i>Loan returns/profits</i>	11,458	0.33	1.11	-0.39	0.02	0.58
<i>Credit risk of loan sales -credit risk of loan purchases</i>	12,152	1.54	5.71	-0.11	0.41	1.34
<i>CLO note price</i>	6,573	4.51	0.14	4.50	4.57	4.60
<i>CLO note tranche amount traded</i>	6,573	1.51	0.68	1.10	1.42	1.80
<i>Rating of CLO note tranche traded</i>	6,573	8.23	5.50	3.00	9.00	12.00
<i>CLO equity price</i>	854	4.21	0.26	3.91	4.24	4.41
<i>CLO equity tranche amount traded</i>	854	1.65	0.70	1.13	1.61	2.08

This table presents descriptive statistics for the variables used in our primary tests. The values of the continuous variables are winsorized at 1% and 99%. Variables are described in Appendix.

**TABLE 3**

*CLO test restrictiveness, CLO characteristics and spread*

<b>Panel A: The relation between CLO test restrictiveness and CLO characteristics</b>					
Variable	(I) <i>CLO test restrictiveness</i>	(II) <i>Capital coverage restrictiveness</i>	(III) <i>Interest coverage restrictiveness</i>	(IV) <i>Risk restrictiveness</i>	(V) <i>Income restrictiveness</i>
<i>Junior to senior note original balance</i>	0.201*** (5.129)	0.927*** (10.813)	0.161** (1.975)	-0.753*** (-7.129)	0.526*** (6.236)
<i>CLO original size</i>	-0.014** (-2.113)	-0.010 (-0.573)	-0.002 (-0.133)	-0.017 (-1.210)	-0.033*** (-3.010)
<i>CLO tranche slicing</i>	-0.000 (-0.269)	-0.002 (-1.079)	-0.001 (-0.405)	-0.001 (-0.478)	0.001 (0.660)
<i>CLO maturity</i>	-0.051*** (-3.485)	-0.170*** (-6.016)	-0.039* (-1.707)	0.104*** (3.318)	-0.100*** (-4.082)
<i>Originated post 2012</i>	0.017*** (2.661)	0.080*** (5.664)	-0.071*** (-5.528)	-0.165*** (-10.420)	0.224*** (16.491)
<i>CLO original tranche rating</i>	0.001*** (5.040)	-0.000 (-0.059)	0.001** (2.450)	0.003*** (5.424)	0.001* (1.875)
R <sup>2</sup>	53.79%	73.66%	28.94%	60.55%	76.36%
Obs.	1,255	1,255	1,255	1,255	1,255

**TABLE 3 (Continued)**

**Panel B: The relation of CLO test restrictiveness and CLO coupon premium**

Variable	<i>Junior coupon premium</i>					
	(I)	(II)	(III)	(IV)	(V)	(VI)
<i>CLO test restrictiveness</i>	<b>-12.228***</b> (-5.367)					
<i>Capital coverage restrictiveness</i>		<b>-8.048***</b> (-6.198)				<b>-6.674***</b> (-5.082)
<i>Interest coverage restrictiveness</i>			<b>-2.247*</b> (-1.843)			<b>-1.215</b> (-1.008)
<i>Risk restrictiveness</i>				<b>0.800</b> (0.870)		<b>-0.902</b> (-0.988)
<i>Income restrictiveness</i>					<b>-7.260***</b> (-5.366)	<b>-4.903***</b> (-3.894)
<i>CLO maturity</i>	2.950*** (3.531)	2.263*** (2.727)	3.854*** (4.432)	3.782*** (4.580)	2.614*** (3.140)	2.463*** (2.956)
<i>CLO original tranche rating</i>	0.090*** (5.939)	0.073*** (5.095)	0.078*** (5.232)	0.069*** (4.501)	0.079*** (5.421)	0.081*** (5.352)
<i>Originated post 2012</i>	-6.823*** (-14.578)	-6.475*** (-13.787)	-7.131*** (-14.674)	-6.865*** (-13.754)	-5.550*** (-9.860)	-5.762*** (-10.602)
<i>CLO tranche slicing</i>	0.461*** (7.078)	0.459*** (7.125)	0.479*** (7.304)	0.447*** (6.688)	0.476*** (7.421)	0.451*** (6.787)
<i>Junior to senior note original balance</i>	29.533*** (9.011)	36.160*** (10.186)	27.471*** (8.540)	29.475*** (8.752)	30.806*** (9.594)	36.193*** (9.963)
<i>CLO original size</i>	-1.818*** (-4.710)	-1.853*** (-5.010)	-1.793*** (-4.468)	-2.047*** (-5.054)	-1.803*** (-4.584)	-1.658*** (-4.217)
R <sup>2</sup>	55.89%	57.44%	53.05%	55.67%	56.97%	57.43%
Obs.	1,255	1,255	1,255	1,255	1,255	1,255

This table reports the analyses of the relation between CLO test restrictiveness and CLO characteristics. Panel A reports the tests on the determinants of CLO test restrictiveness. Panel B reports the tests on the effect of CLO test restrictiveness on the CLO junior note premium. Variables are defined in Appendix. The values of the continuous variables are winsorized at 1% and 99%. CLO manager and arranger fixed effects are included but not tabulated. A constant is included but not tabulated. OLS regressions are used to estimate the models, with T-statistics reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.



**TABLE 4**  
*CLO test restrictiveness and CLO equity returns*

Variable	<i>Equity returns</i>					
	(I)	(II)	(III)	(IV)	(V)	(VI)
<i>CLO test restrictiveness</i>	<b>-3.685***</b> (-4.444)					
<i>Capital coverage restrictiveness</i>		<b>-2.124***</b> (-4.433)				<b>-2.157***</b> (-3.883)
<i>Interest coverage restrictiveness</i>			<b>-0.352</b> (-0.798)			<b>0.203</b> (0.430)
<i>Risk restrictiveness</i>				<b>-0.755*</b> (-1.936)		<b>-0.819**</b> (-2.206)
<i>Income restrictiveness</i>					<b>-1.022**</b> (-2.053)	<b>-0.416</b> (-0.911)
<i>CCC bucket</i>	-6.323*** (-4.369)	-2.981*** (-2.789)	-3.599*** (-3.256)	-7.005*** (-4.708)	-6.303*** (-4.322)	-3.387*** (-3.021)
<i>Default bucket</i>	-1.128 (-1.618)	-2.266*** (-4.783)	-2.706*** (-5.276)	-1.212* (-1.727)	-1.186* (-1.658)	-2.234*** (-4.442)
<i>CLO tranche rating</i>	-0.002 (-0.080)	0.042** (2.187)	0.055*** (2.783)	0.017 (0.675)	0.013 (0.514)	0.051*** (2.586)
<i>Average note coupon</i>	0.013 (0.075)	-0.077 (-0.530)	-0.412*** (-2.917)	-0.168 (-0.961)	0.030 (0.149)	0.013 (0.079)
<i>Junior to senior note principal balance</i>	2.717*** (2.625)	2.925*** (3.652)	1.847** (2.275)	2.002** (2.000)	2.484** (2.412)	2.977*** (3.690)
<i>CLO tranche slicing</i>	-0.005 (-0.181)	-0.022 (-0.936)	-0.015 (-0.631)	0.006 (0.217)	0.003 (0.119)	-0.032 (-1.349)
<i>Capital coverage test violation</i>	-2.645*** (-13.815)	-2.361*** (-15.382)	-2.320*** (-14.641)	-2.645*** (-13.607)	-2.633*** (-13.384)	-2.311*** (-14.322)
<i>Interest coverage test violation</i>	-0.666 (-1.617)	-1.109*** (-4.468)	-1.095*** (-4.500)	-0.660 (-1.566)	-0.691 (-1.622)	-1.102*** (-4.366)
<i>Risk test violation</i>	-0.446*** (-3.763)	-0.727*** (-7.553)	-0.685*** (-6.931)	-0.470*** (-4.079)	-0.524*** (-4.400)	-0.646*** (-6.771)
<i>Income test violation</i>	0.023 (0.171)	-0.170* (-1.795)	-0.185* (-1.909)	0.002 (0.015)	0.032 (0.244)	-0.142 (-1.456)
<i>Originated post 2012</i>	0.207 (0.755)	0.646*** (3.158)	0.720*** (3.369)	0.088 (0.307)	0.221 (0.793)	0.523*** (2.584)
<i>Days to maturity</i>	0.651*** (5.826)	0.714*** (8.423)	0.758*** (8.836)	0.655*** (5.927)	0.674*** (5.962)	0.690*** (8.144)
<i>CLO size</i>	-0.016 (-0.104)	0.447*** (5.834)	0.409*** (5.732)	-0.027 (-0.170)	-0.010 (-0.062)	0.454*** (5.477)
R <sup>2</sup>	42.55%	42.77%	42.34%	37.98%	40.62%	43.27%
Obs.	15,711	15,711	15,711	15,711	15,711	15,711

This table reports the results of the analyses on the relation between CLO test restrictiveness and CLO equity returns. All variables are defined in Appendix. The values of the continuous variables are winsorized at 1% and 99%. CLO reporting year, manager and arranger fixed effects are included but not tabulated. A constant is included but not tabulated. OLS regressions are used to estimate the models, with T-statistics reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

**TABLE 5**

*CLO test restrictiveness and CLO note and equity prices*

Variable	(I) <i>CLO note price</i>	(II) <i>CLO note price</i>	(III) <i>CLO equity price</i>	(IV) <i>CLO equity price</i>
<i>CLO test restrictiveness</i>	<b>0.075**</b> <b>(2.516)</b>		<b>-0.384**</b> <b>(-2.209)</b>	
<i>Capital coverage restrictiveness</i>		<b>0.077***</b> <b>(3.518)</b>		<b>-0.358**</b> <b>(-2.526)</b>
<i>Interest coverage restrictiveness</i>		<b>0.005</b> <b>(0.290)</b>		<b>0.115</b> <b>(1.102)</b>
<i>Risk restrictiveness</i>		<b>0.022*</b> <b>(1.869)</b>		<b>-0.245***</b> <b>(-3.038)</b>
<i>Income restrictiveness</i>		<b>0.041**</b> <b>(2.352)</b>		<b>-0.036</b> <b>(-0.301)</b>
<i>CLO tranche amount traded</i>	0.003* (1.794)	0.002 (1.499)	-0.024** (-2.165)	-0.020* (-1.768)
<i>Rating of CLO tranche traded</i>	-0.005*** (-10.290)	-0.005*** (-9.681)		
<i>CCC bucket</i>	-0.010 (-0.215)	-0.021 (-0.431)	-0.387 (-1.091)	-0.143 (-0.397)
<i>Default bucket</i>	0.057 (1.339)	0.037 (0.759)	-1.385** (-2.324)	-1.486** (-2.042)
<i>Average note coupon</i>	0.041*** (6.122)	0.030*** (3.867)	0.110*** (2.855)	0.139*** (2.947)
<i>Junior to senior note principal balance</i>	-0.073** (-2.127)	-0.086** (-2.376)	-0.017 (-0.074)	0.055 (0.236)
<i>CLO tranche slicing</i>	-0.000 (-0.427)	-0.000 (-0.121)	-0.007 (-1.436)	-0.009* (-1.875)
<i>Capital coverage test violation</i>	-0.049*** (-2.891)	-0.043** (-2.281)	-0.020 (-0.272)	-0.016 (-0.186)
<i>Interest coverage test violation</i>	-0.014 (-0.776)	-0.013 (-0.693)	-0.024 (-0.598)	-0.026 (-0.595)
<i>Risk test violation</i>	0.014*** (3.264)	0.013*** (2.862)	-0.092*** (-3.616)	-0.078*** (-2.896)
<i>Income test violation</i>	-0.005 (-0.942)	-0.009 (-1.619)	-0.061* (-1.761)	-0.059* (-1.684)
<i>Originated post 2012</i>	-0.048*** (-5.155)	-0.050*** (-5.119)	-0.099** (-2.005)	-0.139*** (-2.808)

**TABLE 5 (Continued)**

<i>Days to maturity</i>	-0.031*** (-7.181)	-0.031*** (-7.008)	0.119*** (5.473)	0.121*** (5.406)
<i>CLO size</i>	-0.013*** (-3.187)	-0.015*** (-3.563)	0.112*** (4.198)	0.119*** (4.516)
R <sup>2</sup>	61.68%	62.23%	49.56%	49.87%
Obs.	6,573	6,573	854	854

This table reports the results of the analyses on the relation between CLO test restrictiveness and prices of CLO note tranche trades and CLO equity tranche trades. All variables are defined in Appendix. The values of the continuous variables are winsorized at 1% and 99%. CLO reporting year, CLO tranche seniority (in columns I and II), manager and arranger fixed effects are included but not tabulated. A constant is included but not tabulated. OLS regressions are used to estimate the models, with T-statistics reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

**TABLE 6**

*CLO test restrictiveness and trading activities*

Variable	(I) <i>Portfolio turnover</i>	(II) <i>High trading volume</i>	(III) <i>Avg. loan holding period</i>	(IV) <i>Avg. holding period of loans with (price decrease -price increase)</i>	(V) <i>Loan returns/profits</i>	(VI) <i>Credit risk of loan sales -credit risk of loan purchases</i>
<i>CLO test restrictiveness</i>	<b>0.046***</b> (3.065)	<b>0.353***</b> (2.947)	<b>-0.832**</b> (-2.127)	<b>1.646**</b> (2.333)	<b>-0.675***</b> (-2.630)	<b>-1.757**</b> (-2.037)
<i>CCC bucket</i>	0.125*** (4.280)	-0.161 (-1.058)	0.280 (0.455)	2.141** (1.994)	0.268 (0.646)	0.120 (0.113)
<i>Default bucket</i>	-0.090*** (-5.128)	-0.042 (-0.703)	-0.038 (-0.150)	0.342 (0.600)	0.571** (2.295)	-1.461* (-1.807)
<i>CLO tranche rating</i>	0.003*** (6.334)	-0.001 (-0.336)	0.014 (1.204)	-0.020 (-0.944)	-0.005 (-0.599)	0.033 (1.420)
<i>Average note coupon</i>	-0.003 (-0.768)	-0.010 (-0.747)	-0.704*** (-7.692)	0.297*** (4.407)	-0.041 (-1.416)	0.107* (1.819)
<i>Junior to senior note principal balance</i>	0.004 (0.247)	0.025 (1.308)	1.439*** (3.140)	-0.369** (-2.076)	0.021 (0.075)	0.010 (0.012)
<i>CLO tranche slicing</i>	0.001*** (3.352)	0.013*** (3.504)	0.026** (2.508)	0.067*** (3.404)	-0.005 (-0.758)	0.000 (0.008)
<i>Capital coverage test violation</i>	-0.001 (-0.347)	-0.075*** (-3.319)	-0.363*** (-3.105)	-0.158 (-0.930)	-0.045 (-0.543)	0.133 (0.843)
<i>Interest coverage test violation</i>	-0.039*** (-3.695)	0.003 (0.120)	0.049 (0.341)	-0.330 (-1.043)	0.321** (2.022)	0.156 (0.586)
<i>Risk test violation</i>	-0.034*** (-11.996)	-0.055*** (-3.806)	-0.113** (-2.303)	-0.296*** (-3.314)	0.101*** (2.782)	0.210** (2.309)
<i>Income test violation</i>	-0.015*** (-3.085)	-0.036* (-1.823)	0.209*** (3.907)	-0.117 (-1.132)	0.134*** (2.618)	-0.165 (-1.201)

**TABLE 6 (Continued)**

<i>Originated post 2012</i>	0.048*** (8.372)	0.306*** (9.670)	-0.864*** (-6.499)	0.525*** (4.014)	-0.171*** (-2.586)	0.466*** (3.420)
<i>Days to maturity</i>	0.021*** (9.241)	-0.041*** (-3.521)	-0.239*** (-2.686)	0.477*** (3.259)	-0.247*** (-5.052)	-0.306** (-1.989)
<i>CLO size</i>	0.007*** (3.106)	0.094*** (5.300)	0.086** (2.018)	0.130 (1.142)	0.072** (1.968)	0.347*** (3.351)
R <sup>2</sup>	20.24%	26.62%	35.47%	19.36%	16.27%	24.49%
Obs.	15,711	15,711	11,458	11,458	11,458	12,152

This table reports the results of the analyses on the relation between CLO test restrictiveness and CLO manager's trading activities. All variables are defined in Appendix. The values of the continuous variables are winsorized at 1% and 99%. CLO reporting year, manager and arranger fixed effects are included but not tabulated. A constant is included but not tabulated. OLS regressions are used to estimate the models, with T-statistics reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

**TABLE 7**

*CLO test restrictiveness, trading activities and equity returns*

Variable	Equity returns					
	(I)	(II)	(III)	(IV)	(V)	(VI)
<i>CLO test restrictiveness</i>	-2.605*** (-3.373)					
<i>Portfolio turnover</i>	<b>3.207***</b> <b>(9.968)</b>					
<i>CLO test restrictiveness x Portfolio turnover</i>	<b>-3.689***</b> <b>(-3.606)</b>					
<i>CLO test restrictiveness</i>		-2.770*** (-3.634)				
<i>High trading volume</i>		<b>0.532***</b> <b>(8.866)</b>				
<i>CLO test restrictiveness x High trading volume</i>		<b>-2.085**</b> <b>(-2.480)</b>				
<i>CLO test restrictiveness</i>			-1.988** (-2.246)			
<i>Avg. loan holding period</i>			<b>-0.024</b> <b>(-0.830)</b>			
<i>CLO test restrictiveness x Avg. loan holding period</i>			<b>-1.332*</b> <b>(-1.798)</b>			
<i>CLO test restrictiveness</i>				-2.837*** (-3.242)		
<i>Holding period of loans with (price decrease -price increase)</i>				<b>0.050***</b> <b>(3.587)</b>		
<i>CLO test restrictiveness x Holding period of loans with (price decrease -price increase)</i>				<b>0.308</b> <b>(0.879)</b>		
<i>CLO test restrictiveness</i>					-0.027*** (-3.057)	
<i>Loan returns/profits</i>					<b>0.001***</b> <b>(3.505)</b>	
<i>CLO test restrictiveness x Loan returns/profits</i>					<b>-0.016***</b> <b>(-3.093)</b>	
<i>CLO test restrictiveness</i>						-1.968** (-2.538)
<i>Credit risk of loan sales -credit risk of loan purchases</i>						<b>0.023***</b>

**TABLE 7 (Continued)**

						(5.335)
<i>CLO test restrictiveness x Credit risk of loan sales -credit risk of loan purchases</i>						<b>-0.559***</b>
						<b>(-4.357)</b>
Controls	YES	YES	YES	YES	YES	YES
R <sup>2</sup>	45.53%	45.30%	35.47%	46.53%	42.19%	48.93%
Obs.	15,711	15,711	11,458	11,458	11,458	12,152

This table reports the results of the analyses on the relation between CLO trading activities and quarterly equity distributions on a cash-flow basis by CLOs with restrictive tests. All variables are defined in Appendix. The values of the continuous variables are winsorized at 1% and 99%. CLO reporting year, manager and arranger fixed effects are included but not tabulated. A constant is included but not tabulated. OLS regressions are used to estimate the models, with T-statistics reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.



**TABLE 8***CLO test restrictiveness and likelihood of test violation*

	(I)	(II)	(III)	(IV)	(V)
Variable	<i>CLO test slack</i>	<i>Probability of 5% CLO test slack</i>	<i>Default bucket</i>	<i>CCC bucket</i>	<i>CLO tranche rating downgrade</i>
<i>CLO test restrictiveness</i>	<b>0.006</b>	<b>0.129</b>	<b>0.046</b>	<b>-0.023</b>	<b>-0.029</b>
	<b>(0.575)</b>	<b>(0.973)</b>	<b>(1.493)</b>	<b>(-1.416)</b>	<b>(-0.537)</b>
Controls	YES	YES	YES	YES	YES
R <sup>2</sup>	68.27%	19.72%	33.66%	46.05%	48.17%
Obs.	15,711	15,711	15,711	15,711	15,711

This table reports the results of the analyses on the relation between CLO test restrictiveness and CLO performance. *CLO test slack* is the average standardized slack across CLO tests (capital coverage, interest coverage, income and risk). CLO test slack is the percentage difference between the CLO test score minus the CLO test threshold (CLO test threshold minus the CLO test score for the risk test). The CLO test slack is then standardized based on the distribution of this variable. *Probability of 5% CLO test slack* is an indicator variable of whether the slack of a CLO test is between 0% and 5%, and zero otherwise. *CLO tranche rating downgrade* is an indicator variable of whether a CLO tranche has been downgraded by at least one notch since previous quarter, and zero otherwise. All other variables are defined in the Appendix. The values of the continuous variables are winsorized at 1% and 99%. In columns I and II, the CLO test violation variables are excluded from the control variables. In column III (IV), the variable *Default bucket* (*CCC bucket*) is excluded from the control variables. All model specifications and the other control variables (untabulated) are the same as in Model 2. CLO reporting year, manager and arranger fixed effects are included but not tabulated. A constant is included but not tabulated. OLS regressions are used to estimate the models, with T-statistics reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

**TABLE 9***Alternative measure for CLO test restrictiveness and CLO equity returns*

Variable	Equity returns
<i>Lax CLO test restrictions upon origination</i>	<b>0.003**</b> <b>(2.126)</b>
<i>CCC bucket</i>	0.013 (0.792)
<i>Default bucket</i>	-0.024*** (-3.615)
<i>CLO tranche rating</i>	0.001*** (3.188)
<i>Average note coupon</i>	0.003*** (3.016)
<i>Junior to senior note principal balance</i>	0.002 (0.217)
<i>CLO tranche slicing</i>	-0.000 (-0.735)
<i>Capital coverage test violation</i>	-0.007 (-1.521)
<i>Interest coverage test violation</i>	0.005 (1.295)
<i>Risk test violation</i>	-0.002** (-2.398)
<i>Income test violation</i>	-0.000 (-0.306)
<i>Originated post 2012</i>	0.008** (1.992)
<i>Days to maturity</i>	0.002 (1.552)
<i>CLO size</i>	-0.004** (-2.055)
R <sup>2</sup>	36.78%
Obs.	2,602

This table reports the results of the analyses on the relation between CLO test restrictiveness and CLO equity returns using an alternative measure for CLO test restrictiveness. We measure CLO test restrictiveness by how close a test threshold is set relative to the level of test score at the inception of the CLO. Focusing on CLOs originated post 2009, we measure the initial slack of the capital coverage, interest coverage, risk and income test by [(test score up to one quarter post CLO origination- test threshold)/ test threshold]. We average initial slack across all tests. *Lax CLO test restrictions upon origination* is an indicator of whether a CLO's initial average test slack is ranked in the upper quintile of the distribution, and zero otherwise. This restrictive sample includes 311 unique CLOs. All other variables are defined in Appendix. The values of the continuous variables are winsorized at 1% and 99%. CLO reporting year, manager and

arranger fixed effects are included but not tabulated. A constant is included but not tabulated. OLS regressions are used to estimate the models, with T-statistics reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the CLO level. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.